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Electronic Individual Weapon (EIW):
A Concept Update

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Electronic Individual Weapon

The Focus for Change

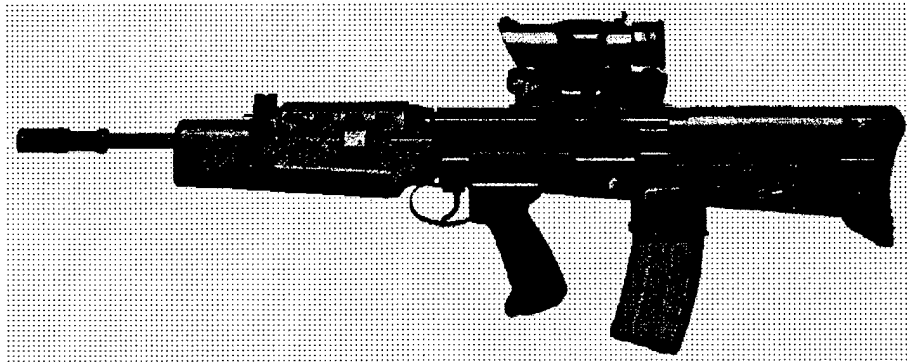
- Current (percussion) ignition systems are in excess of 100 years old: new technologies offer potential for significant system performance improvements.
- Advances in electronic systems and sensors offer potential for greater degree of weapon control (rate of fire, burst length, etc).
- Interfaces with Future Infantry System Technologies simplified.
- Electronics offer potential to increase reliability, security and ease of use.

Electronic Individual Weapon Advantages

- Interactive interface with Future Infantry System Technology (FIST) - e.g. weapon status indicated in soldier's display - and other battlefield systems become possible.
- Elimination of mechanical linkages reduces design constraints (especially weapon/man interface).
- Rate-of-fire control offers potential to improve dramatically burst-fire consistency.
- Potential to improve reliability and security (weapon coding and immobilisation).

Electronic Individual Weapon Configuration

- L85A1 Individual Weapon based system



- Mechanical trigger group replaced by electronic control module
- 5.56mm electrically initiated ball round ammunition
- On-board sensors for loaded round and barrel temperature
- On-board battery power
- Reprogrammable electronic control module for test purposes

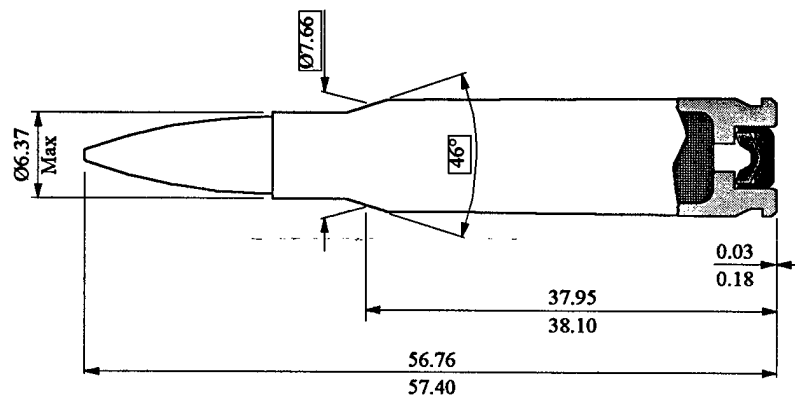
Electronic Individual Weapon Weapon Features

- Re-programmable rate-of-fire and burst length for each selector switch setting.
- LED indicator (auto-dimming at night) shows: ready to fire status, cook-off temperature warning, low battery warning.
- Non-volatile memory records total number of rounds fired.
- Trigger has conventional weapon "feel".

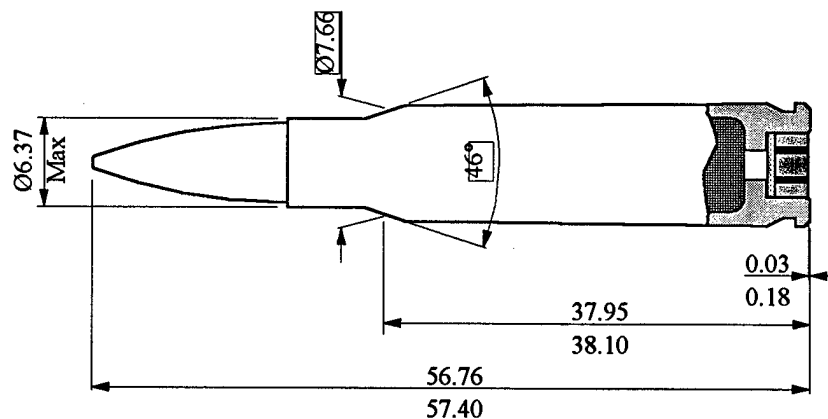
Electronic Individual Weapon Ammunition Features

- Ammunition uses standard cartridge case, propellant composition and bullet
- Glass to metal seal incorporates an electrically initiated primer
- Bridgewire technology offering greater reliability and acceptable route for manufacture

Electrically Individual Weapon 5.56mm Ammunition



Standard Percussion Ball Round



Electrically Initiated Ball Round

Electronic Individual Weapon System Safety Features

- Barrel, bolt and bolt-locking mechanism are unchanged from standard L85A1.
- Electrical circuit to firing contact (pin) is not completed until the bolt carrier is fully forward.
- Battery power is only connected to the firing circuit when the safety switch is set to "Fire".
- The firing circuit is interrupted by two transistor switches, one operated solely by the trigger, the other by the micro-processor.
- The state of the trigger switch is checked each time the safety switch is set to "Fire".

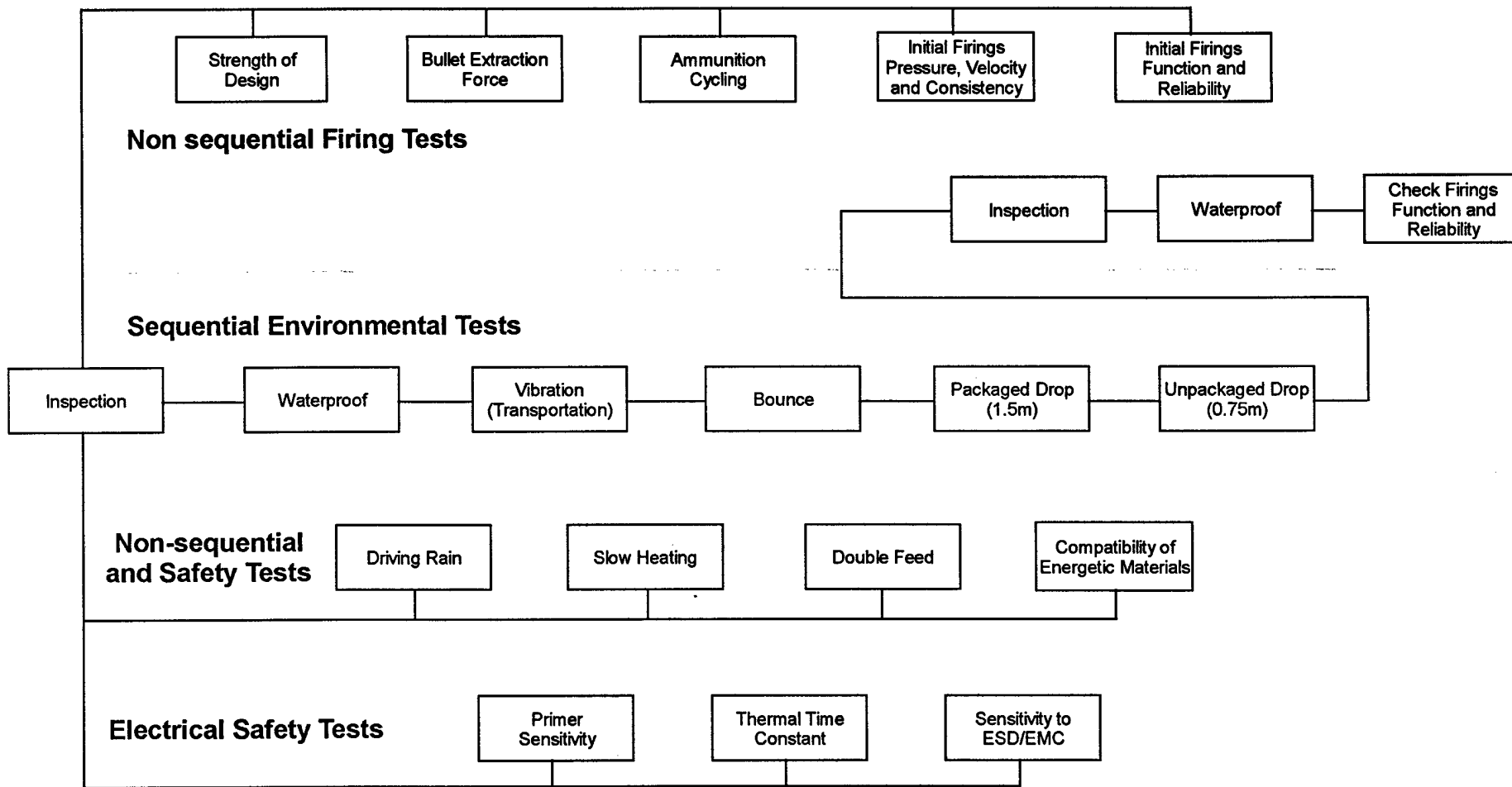
Electronic Individual Weapon Program Outline

- The EIW program in 1997 focused on determining the maturity of the technology and providing data on its system performance.
- Approach was to produce weapons and ammunition for live-firing by soldiers under controlled conditions. This required Ordnance Board (OB) clearance, following successful completion of a testing program defined by the OB.

Electronic Individual Weapon Scope of Ordnance Board Tests

- Weapon and Ammunition : full program of tests, including :
 - weapon : including functioning, drop and immersion
 - ammunition : full ammunition schedule
 - electrostatic discharge (ESD) and electromagnetic compatibility (EMC)

Electronic Individual Weapon Ordnance Board Tests for Field Firing Clearance



Electronic Individual Weapon Manned Firing Trials



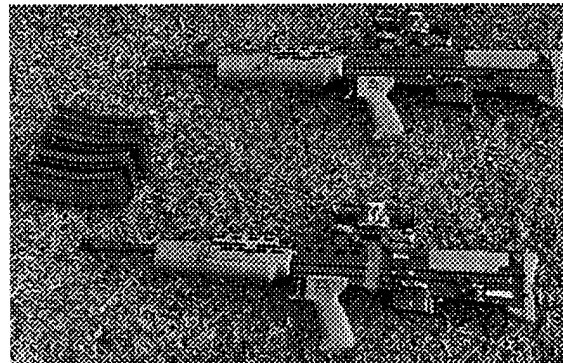
Prone



Prone



Kneeling



L85A1
EIW



Standing

Electronic Individual Weapon Manned Firing Trials

- Aimed to provide supporting data on EIW system performance, especially :
 - accuracy / dispersion characteristics of EIW under controlled manned firing conditions
 - informed user views on ease of use / current system layout
 - potential EIW benefits and risk reduction areas for future attention

Electronic Individual Weapon Summary of Manned Firing Trials

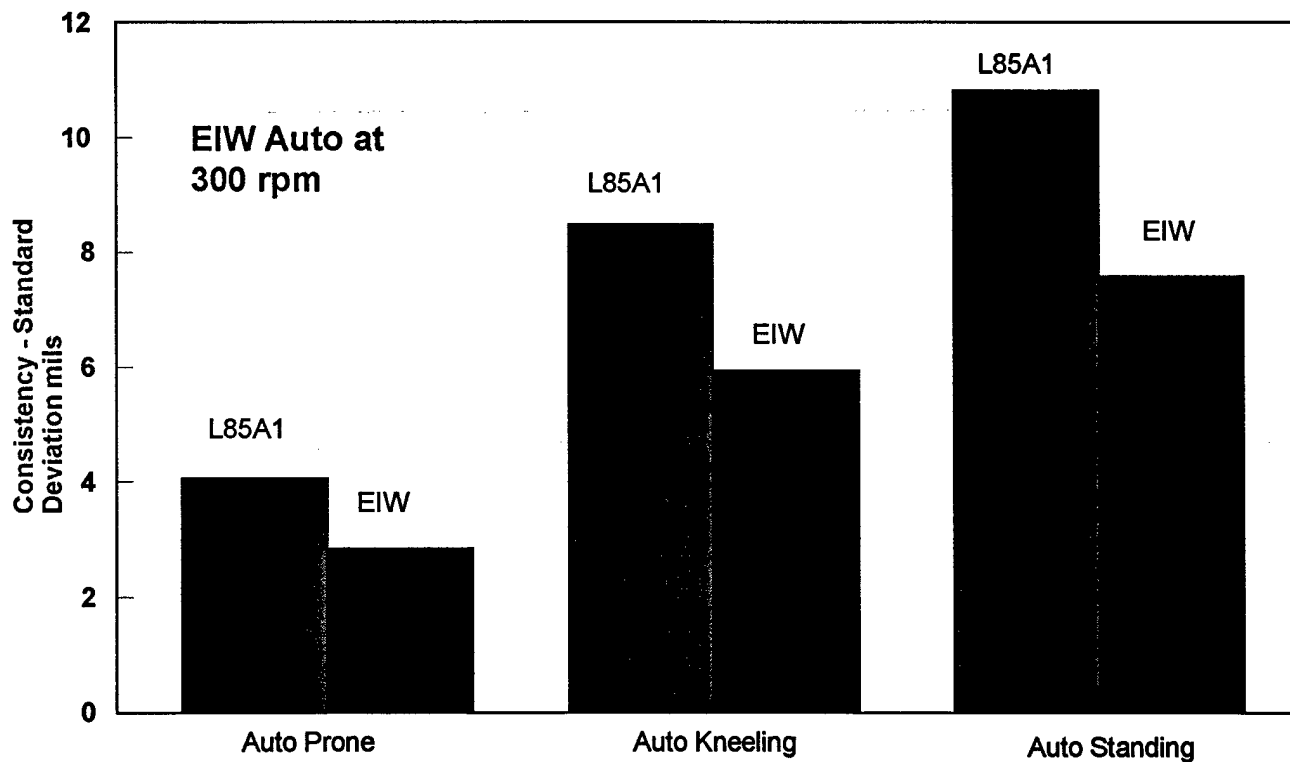
- Three firers : each firer used an EIW and a standard L85A1(as a baseline comparison)
- Firings in prone / kneeling / standing positions
- Single shot and burst fire (both weapons)
- EIW97 burst fire cyclic rates were 300 / 450 / 700 rpm, firing at 30m and 50m
- Taguchi experimental design for data capture dictated serials and firing sequence
- Selected serials repeated for proof mount firing of EIW / L85A1 to capture basic weapon dispersion data

Electronic Individual Weapon Trials Results

- EIW firing at 300 rpm gave an overall 30% reduction in burst fire dispersion compared with either L85A1 or EIW at higher rates of fire
- EIW firing at 300 rpm gave 19% more hits on Figure 11 targets compared with either L85A1 or EIW at higher rates of fire
- Excellent reliability of EIW weapon and ammunition during manned firing of approximately 1030 rounds

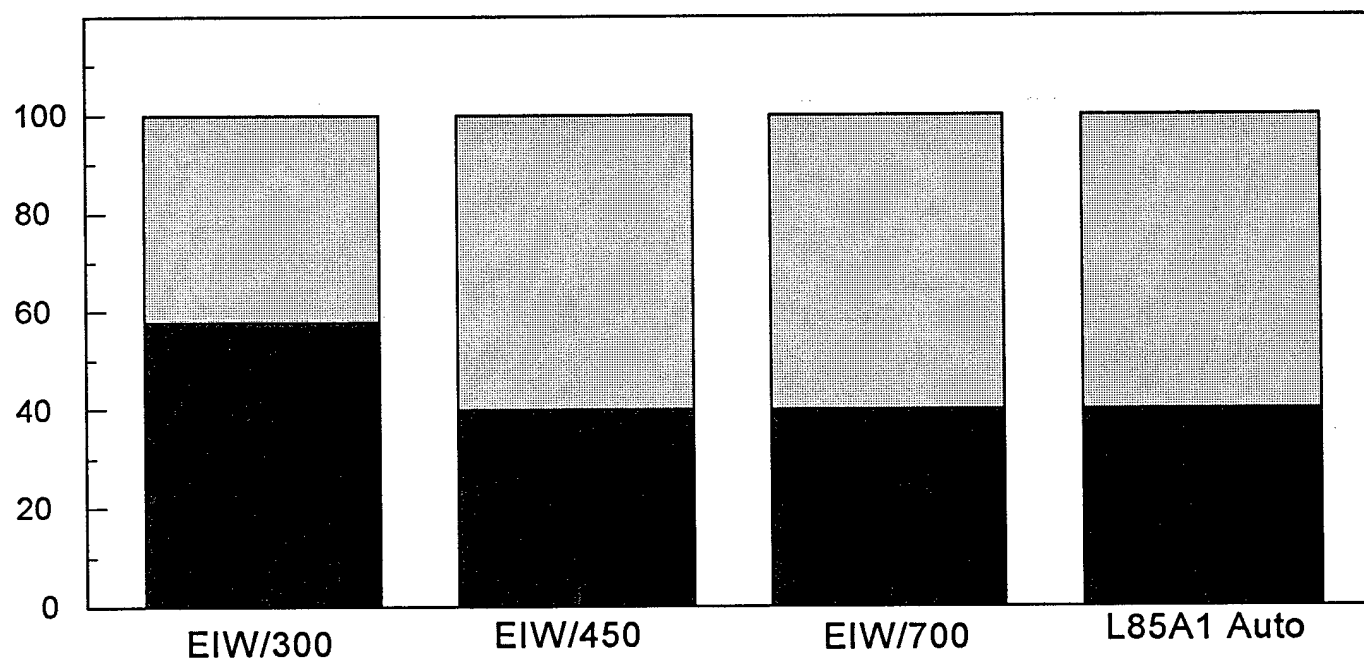
Electronic Individual Weapon Consistency in Burst Fire

EW vs L8A1 Consistency (All Firers)



Electronic Individual Weapon Hit Probability on Figure 11 Target

Hit
Probability
(%)



Electronic Individual Weapon

Marksman Firer (Prone, 50m, 3 round burst)

Weapon	Mean Radius mm	Standard Deviation mm	SD mils ⁽¹⁾
EIW @ 300 rpm	138.5	135.4	2.71
L85A1	197.6	193.2	3.86
Difference	59.1	57.8	1.15

30% improvement in consistency

⁽¹⁾ SD=MR*0.9775 Ref. Statistical Measures of Accuracy for Riflemen and Missile Engineers. Frank E. Grubbs

Electronic Individual Weapon Firer Feedback

- General : all preferred the slow rate of fire (300 rpm) in burst fire
- Selected comments on EIW :
 - “Slow rate of fire meant less recoil...movement of weapon is a lot less, i.e. the high right effect has gone.”
 - “If adapted to LSW, slow rate would make a large difference...our fire would be at least 80% more accurate at longer range.”
 - “Slow rate only-lot better for an infanteer. More hits on enemy at range means we are a more effective fighting force.”

Electronic Individual Weapon Way Ahead

- **System Developments** : optimisation of system features (e.g. trigger mechanism, weapon control module)
- **Technology Migration** : Light Support Weapon variant (ELSW) has been manufactured for testing in 1998. Consideration being given to application of the technology to other systems.
- **System Enhancements** : EIW now included in UK FIST Technology Demonstrator program. Investigations also into smart sighting systems (fire on target recognition).

Electronic Individual Weapon

Specific Areas for Future Development

- Application to multi-function weapons (one trigger programmable to operate all functions)
- Integration with Future Soldier system (FIST)
- Investigation of optimum ergonomic positioning of trigger switch and other controls
- Security coding of weapon (e.g. by transponder / digital coding)
- Fire on target recognition
- Alternative power sources

Electronic Individual Weapon Summary

- EIW technology proven in live firing trials by troops
- System has proved reliable
- Slow rate of fire (300 rpm) gives 30% reduction in burst fire dispersion, 11% improvement in hit probability against a Figure 11 target
- Technology migration to other weapons has begun (ELSW) and incorporation of EIW into UK FIST TD program
- Potential application to other systems, including multi-function weapons
- Areas for future developments identified